

Kehang Zhu

Harvard University

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EDUCATION

Ph.D., Harvard University

Sept. 2021 – Present

- Physics
- Secondary field in Computer science and engineering

S.M., Harvard University

Sept. 2021 – May 2024

- Major in Computer Science
- Thesis: Multi-agent interaction using Large language model (In Progress)

B.A., University of Science and Technology of China (USTC)

Sept. 2017 – July 2021

- Major in Physics

AWARDS & HONORS

- ◇ 2024 *Introduction to Technical AI Safety Fellowship, Harvard*
- ◇ 2024 *APS March Meeting selected press coverage*
- ◇ 2023 *Sky9 Innovation Fellowship*
- ◇ 2021 *Purcell Fellowship, Harvard*
- ◇ 2020 *Guo Moruo Scholarship (Highest honor for USTC undergrad students)*
- ◇ 2020 *Yan Jici Scholarship (Highest honor for Physics department undergrad students)*
- ◇ 2019&2018 *National Scholarship (top 1%)*

WORKING PAPER

- Automated Social Science: A Structural Causal Model-Based Approach (with John J. Horton & Benjamin Manning).

PUBLICATION

- Bae, Henry, Aggyad Deeb, Alex Fleury, and **Kehang Zhu***. "ComplexityNet: Increasing LLM Inference Efficiency by Learning Task Complexity." arXiv preprint arXiv:2312.11511 (2023, submitted).
- Benjamin Manning*, **Kehang Zhu***, John Horton. Automated Social Science: Using Large language Models to Identify Causal Relationships in Social Phenomena (2023 ICLC)
- **Kehang Zhu***, Benjamin Manning*, John Horton. Silica Scientist: A Tool for Automated Causal Hypothesis Generation and Simulated Experimental Validation (2023 CODE)
- Carolina Nobre*, **Kehang Zhu***, Eric Morth, Hanspeter Pfister, Johanna Beyer. Reading Between the Pixels: Investigating the Conceptual Hurdles to Visualization Literacy (2024 IEEE CHI)
- **Kehang Zhu**, Zhiping Yang et.al., Experimental sensing of a quantum atmosphere of a single spin, Quantum Frontier Volumn3, Article 1 (2020)

CONFERENCE PRESENTATIONS

- CHI, Association of Computing Machinery, Paper Presentation (co-author) May 2024
- APS March Meeting, American Physical Society, Focused Talk Mar 2024
- Interactive Causal Learning Conference, Florida Atlantic University, Paper Presentation (co-author) Dec 2023
- Conference On Digital Experimentation (CODE), MIT, Paper Presentation (co-author) Nov 2023
- APS March Meeting, American Physical Society, Focused Talk Mar 2022

INVITED TALKS

- AI Institute for Artificial Intelligence and Fundamental Interactions, MIT Feb 2024
- Human-computer Interaction group, Harvard Nov 2023

RESEARCH

2023.5 – Now *Large language model and Causal Inference, Econometrics*

MA, USA

Supervisor: Prof. John Horton (MIT Sloan Business School)

& Prof. David Parkes (Harvard EconCS group)

- Developed an end-to-end automatic pipeline that encompasses causal hypothesis generation, experimental design, simulation execution, econometric data collection, and hypothesis validation utilizing large language models (LLMs).
- Designed an algorithm for instantiating LLMs as human agents and their interaction
- Provided a sandbox to simulate and analyze various social scenarios – from wage bargaining to auction mechanics with the flexibility to vary agent properties across a nearly infinite parameter space

2023.3 – 2023.8 *Human-computer Interaction and Visualization*

MA, USA

Supervisor: Prof. Hanspeter Pfister (Harvard CS department)

Prof. Carolina Nobre (CS department, University of Toronto)

- Used Qualtrics and D3.JS to build an empirical study that investigates the rationale behind mistakes in the visualization literacy assessment test.
- Applied eye-tracking technology to track the user's gaze when taking the visualization literacy assessment test.
- Built a mental model for conceptual barriers in interpreting data visualizations

2022.5 – 2023.5 *Graph Neural Network and Machine Learning for material*

MA, USA

Supervisor: Prof. Boris Kozinsky (Harvard SEAS)

- Used Equivariant graph neural network (GNN) and Gaussian Process (GP) regression to study the conductance of Solid state battery electrolyte Li3PO4.
- Applied Density Functional Theory(DFT) package like VASP and Quantum Espresso to perform ab-initio calculation on Li3PO4 to build up dataset for machine learning
- Developed parallel computing in Harvard FAS Research Cluster(RC) to accelerate the computation.

2021 – 2022.5 *Quantum Computing*

MA, USA

Supervisor: Prof. Amir Yacoby (Harvard Physics)

- Explored the signal processing method of Fourier imaging to break the diffraction limit of ensemble NV centers magnetometry
- Used a nanoscale magnetic field sensing platform to obtain the signal in Superconductor Josephson Junction.
- Used the random sparse sampling analysis method to reconstruct the 2D periodic magnetic field distribution
- Developed Diffusive Monte Carlo Algorithm to simulate the non-equilibrium dynamics of dipolar spin ice (DSI)

2020 – 2021 *Computational Quantum material and Quantum information*

MA, USA

Supervisor: Prof. Frank Wilczek (MIT theoretical physics center)

- Developed Quantum Monte Carlo to carry out the simulation of the emergent photon and spinon behavior in quantum spin ice (QSI)
- Developed the quantum worm algorithm (WA) to study minimal model--XXZ model on the pyrochlore lattice
- Measured QSI's thermodynamics and added additional terms to tune the speed of light and emergent charge and see how physical observables change by tuning these parameters

2018 – 2020 *Quantum computing*

Hefei, China

Supervisor: Prof. Jiangfeng Du & Prof. Rong Xing (USTC)

- Built up an Nitrogen-vacancy (NV) center quantum Sensing platform using laser and microwave
- Designed a CNOT-like gate to perform non-demolition measurement of nuclear spin's quantum state
- Searched for Spin-Dependent Interaction Mediated by Axion-Like Particles using NV center

TEACHING

- 2023-2024, Leading TA, Harvard Physics 262/ Applied Physics 284 – Statistical Mechanics
- 2023, Harvard Physics 1-A – Introduction to Physics

REVIEW

- ICML
- ACM CHI / Vis / Pacific Vis/ EuroVis
- International Conference on Neural Information Processing (ICONIP)

SKILLS

- Analysis: C++/ Python/ Julia/ R/ MySQL
- Full-stack: REACT, Flask, FastAPI
- Visualization: D3.JS, R
- Cloud computing: Azure, google cloud
- Machine learning: Pytorch, Tensorflow, JAX, NLP.
- User Study: Qualtrics
- Finance (HKS API141)

ACTIVITY INVOLVEMENT

Harvard GSAS Entrepreneurship Community, a Harvard student organization aiming to promote innovation and Entrepreneurship among graduate students.

President

MA, USA

2021.12 – 2022.12

Harvard GSAS Web3 Demo Day, a Demo show for innovations on Web3 and Metaverse technologies.

Co-organizer

MA, USA

2022.11